RCA-EO

Requirements, Capabilities, and Analysis for Earth Observations

Evaluating remote sensing data impacts from the bottom up – A USGS example

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JACIE 2016, Fort Worth, TX

U.S. Department of the Interior
U.S. Geological Survey

Overview

- RCA-EO Project Overview
- Value Tree Information Overview
- Impact Assessment and Insights
- Next Steps

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Purpose of RCA-EO

RCA-EO provides decision support to optimize Earth Observation investments – USGS and beyond

- Comprehensively understand USGS and external use of and needs for Earth observations
- Enhance USGS products and services to better address user needs
- Support Office of Science and Technology Policy (OSTP) National Earth Observation Assessments (EOA)

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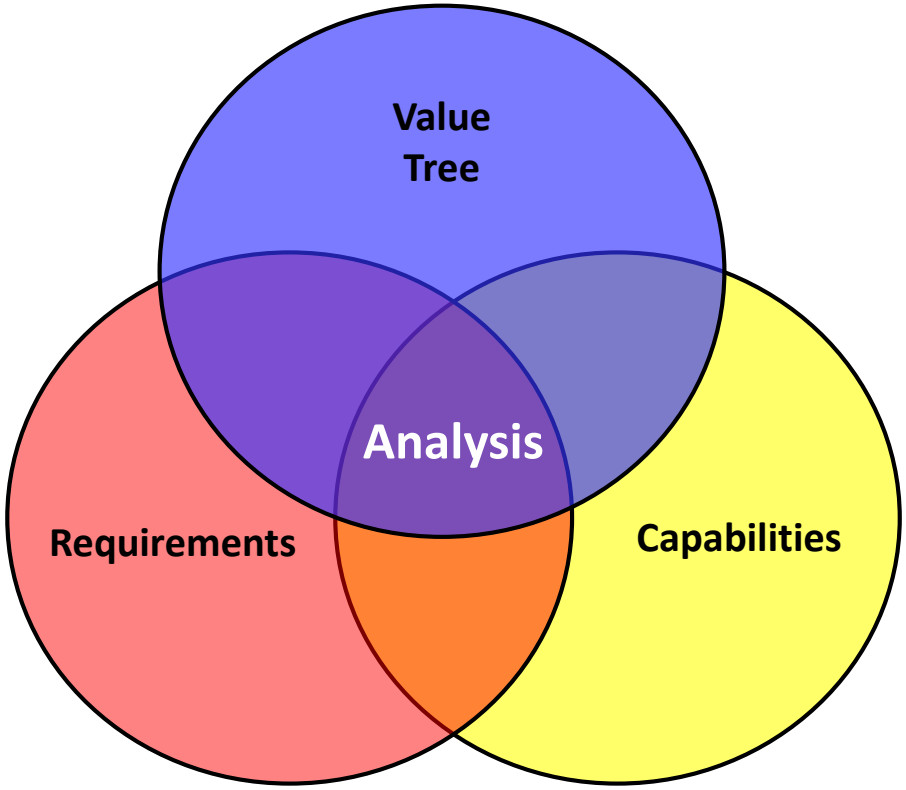
RCA-EO Components



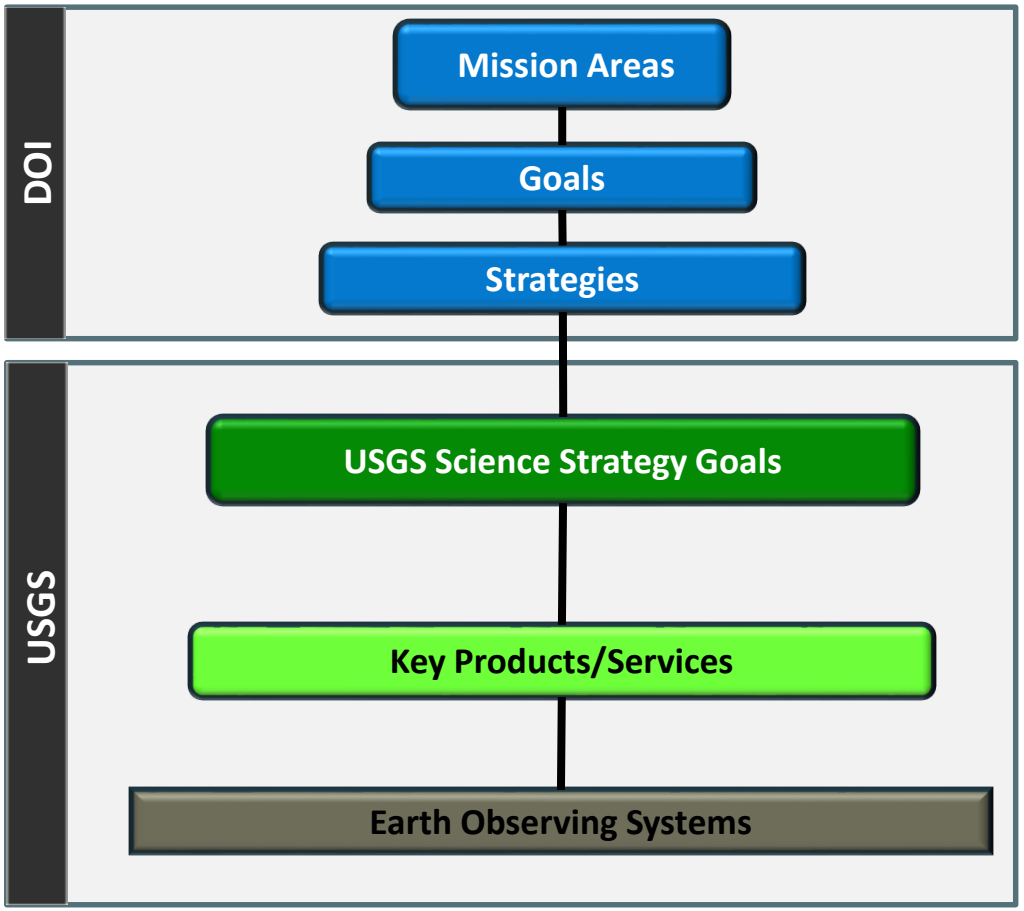
Databases:

- **Value Tree** – Current USGS products and services organized in an organizational or strategic framework
- **User Requirements** - Earth observing, system-independent, application needs
- **Observing Systems Capabilities** - Current and future Earth observing systems
- **Information Infrastructure EORES** – Joint USGS and NOAA development partnership

RCA-EO goal is to better meet user needs through enhanced products and services supported by Earth observations

USGS Value Tree

Links Earth observing system data to US Geological Survey (USGS) and Department of the Interior (DOI) goals in a strategic framework



Over the last 18 months:

- 24 USGS Programs elicited
- 500+ scientists engaged
- 345 Key Products/Services evaluated
- 1000+ data sources identified and assessed

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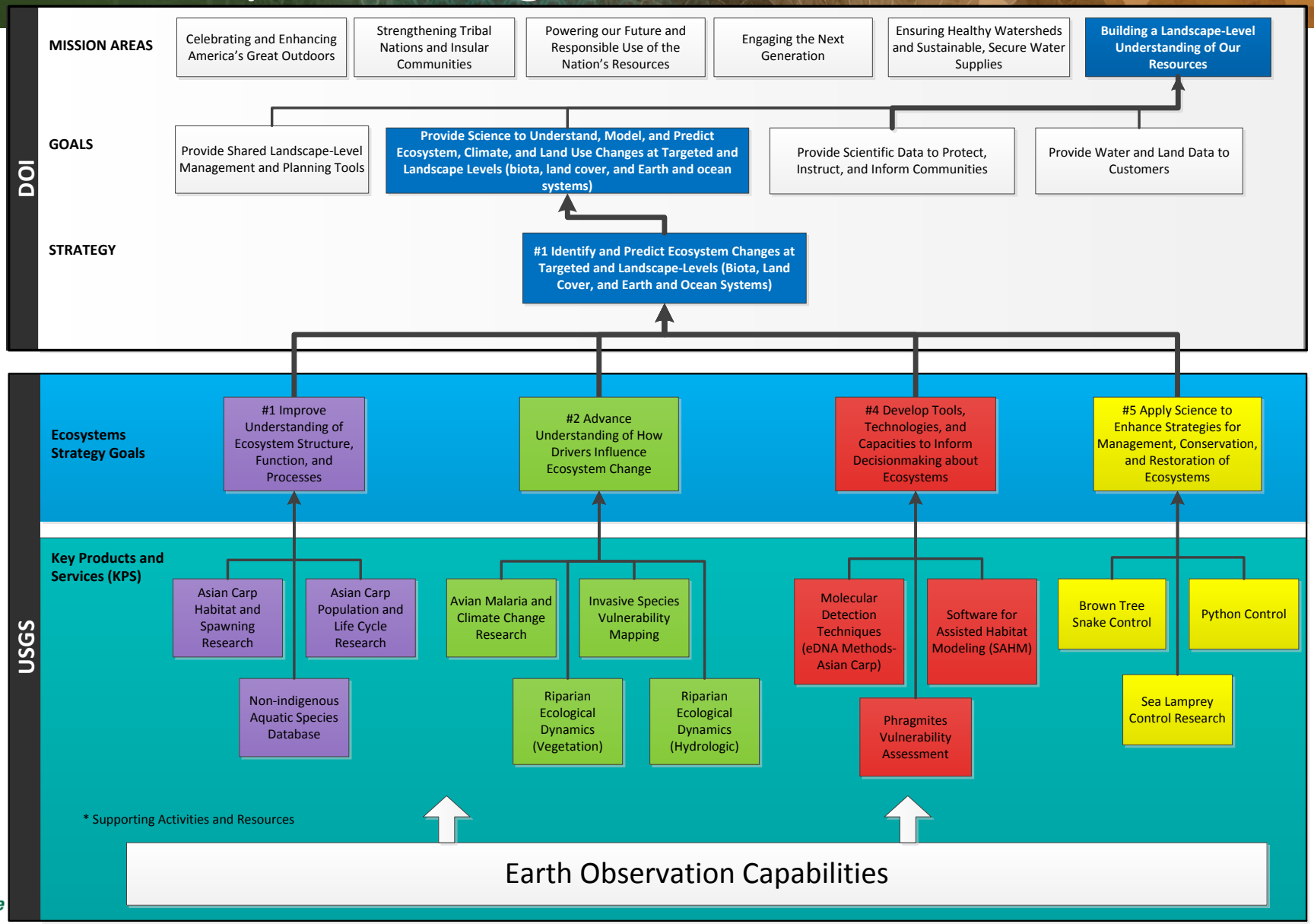
USGS Value Tree: Invasive Species Program



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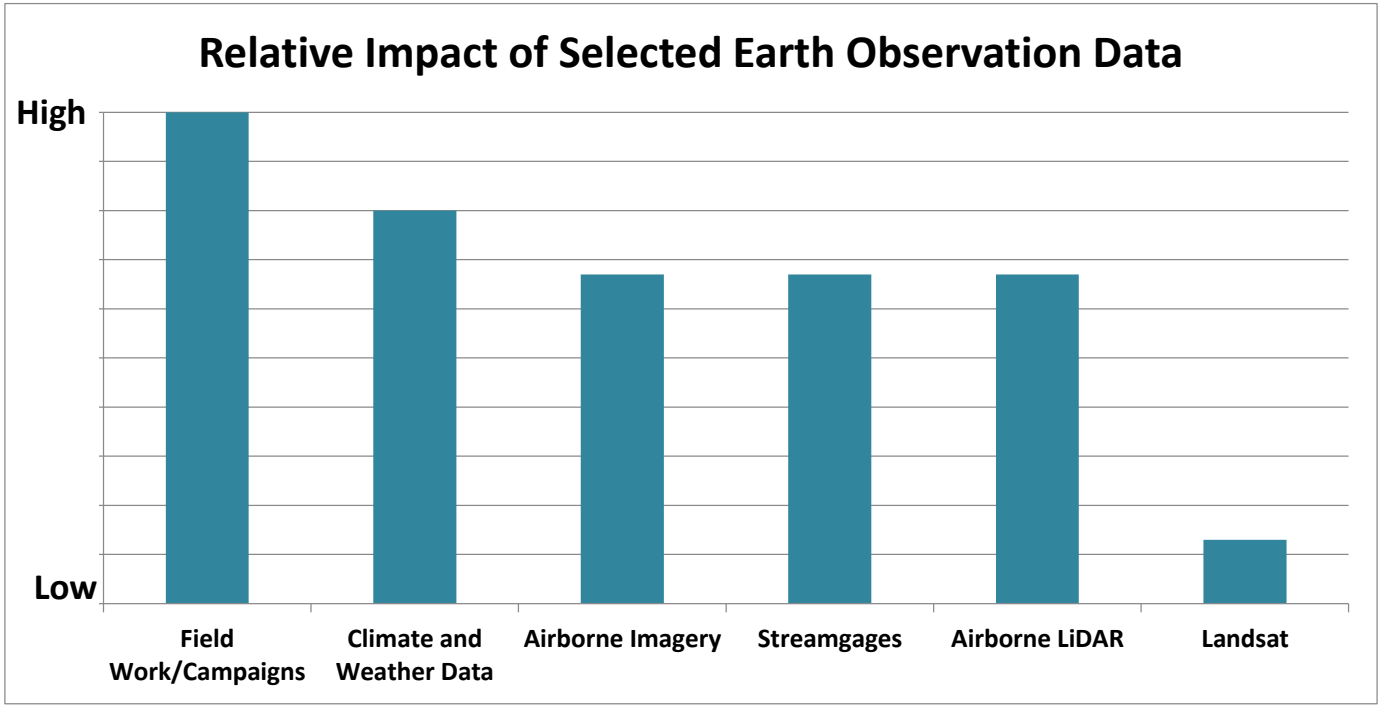
Colorado River Riparian Vegetation Dynamics – Tamarisk Research

USGS Ecosystems Invasive Species Program

- Field work is the most critical contributor to this research; weather/climate data and streamgage information also very important
- Supported by remote sensing: airborne imagery (identify plant communities), airborne lidar (canopy structure/habitats, elevation), and Landsat imagery to a lesser degree

Tamarisk



Future Needs:

- Would like more high resolution aerial imagery - expensive
- Lidar is also expensive and the data can be inconsistent

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Highest Impact Observing Capabilities and Datasets in USGS

Field Work/Campaigns	Very High
USGS Stream Gage Network	High
Airborne LiDAR	High
Landsat	High
GPS	High
National Elevation Dataset	High
Airborne High-Resolution Imagery	High
Geologic Data and Reports	Moderate
National Hydrography Dataset (NHD)	Moderate
USGS Water Quality Samples	Moderate
GoogleEarth	Moderate
Bathymetry	Moderate
USGS Geomagnetic Observatories	Moderate
Satellite High Resolution Imagery	Moderate
Radio Telemetry Data	Moderate
Airborne Geophysical	Moderate
Satellite Telemetry Data	Moderate
Seismic Profiling (Terrestrial and Marine)	Moderate
MODIS (Aqua and Terra)	Low

Legend - Impact Categories
Very High
High
Moderate
Low
Supplemental
No Impact

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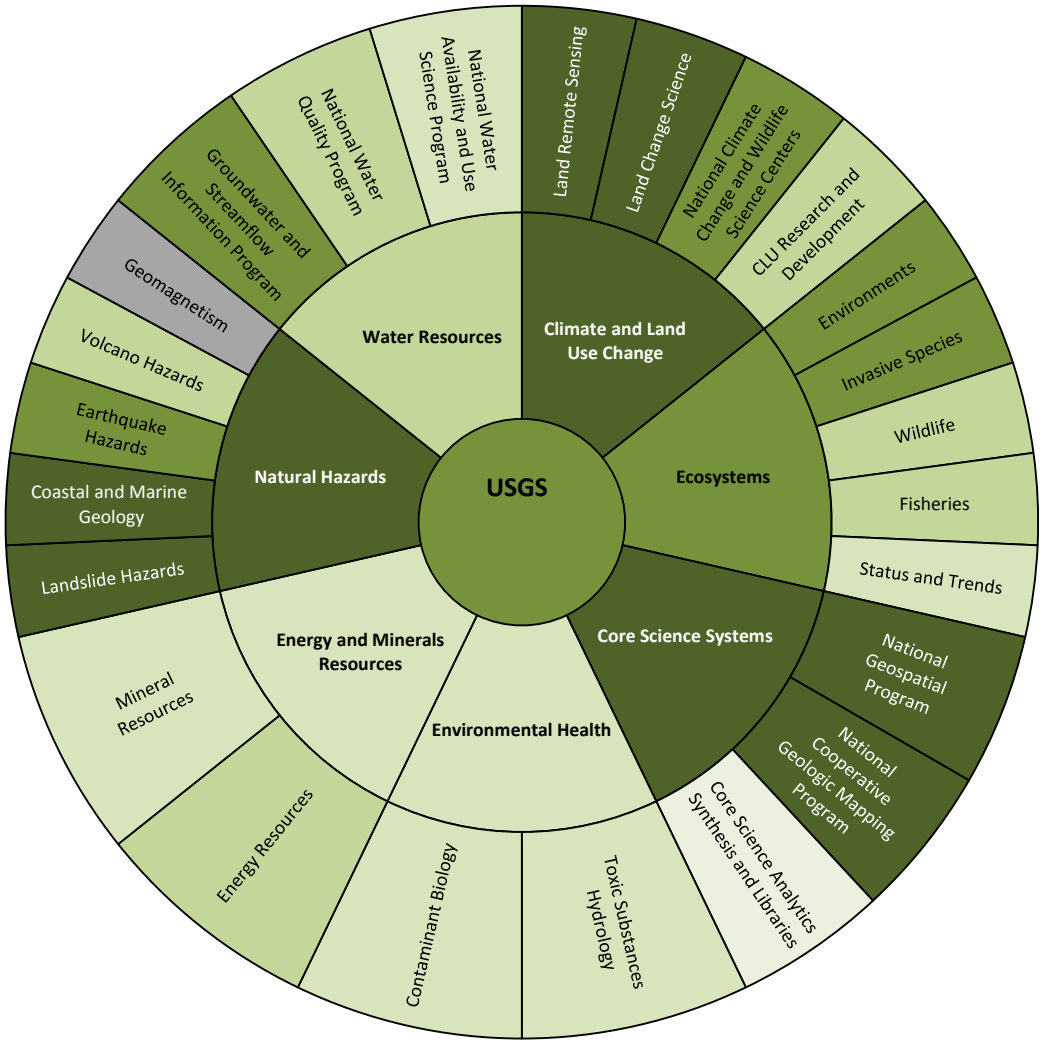
Lidar Impact on USGS*

Lidar summary (airborne and terrestrial)

- All 7 mission areas use Lidar
- 23 out of 24 programs use Lidar
- 86 products/services surveyed use Lidar
- Engaged 84 subject matter experts
- Major applications include ecosystems, natural hazards, and geologic and coastal mapping

Legend - Impact Categories
Very High
High
Moderate
Low
Supplemental
No Impact

Airborne Lidar Impacts



* Impact of loss of all airborne Lidar data on USGS Programs

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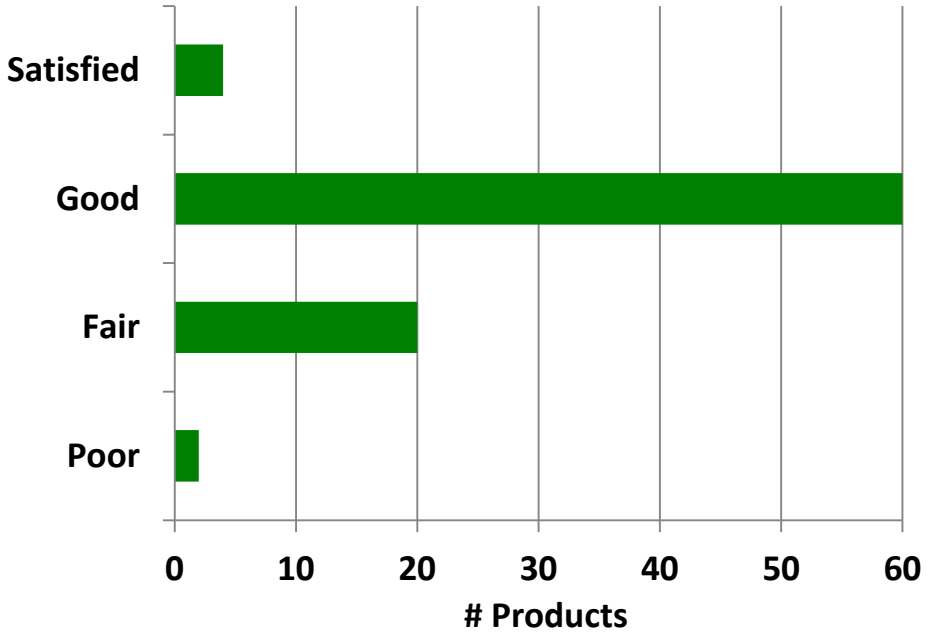
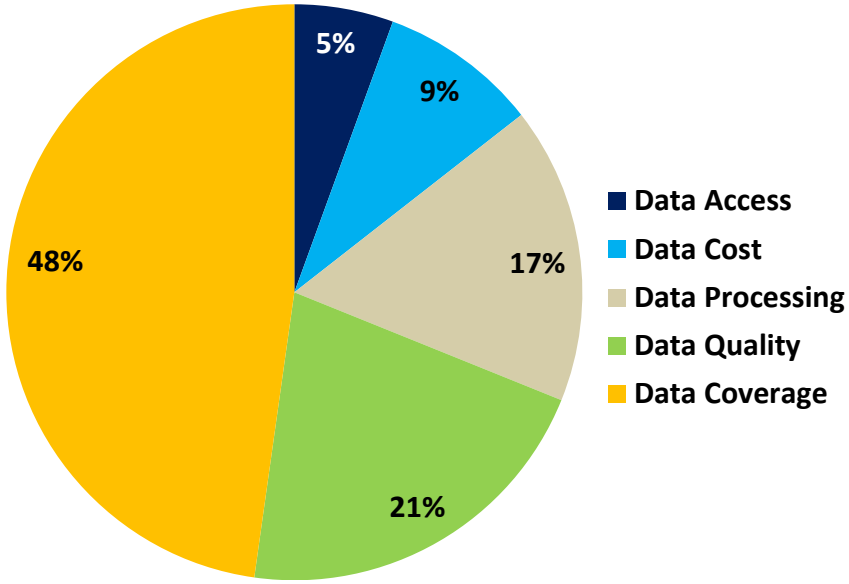
User satisfaction for Lidar in USGS

❖ **Identify where data investments might be needed**

User satisfaction of Lidar data



Current Lidar Data Limitations



- Lidar data are critical: commercial airborne lidar, airborne lidar bathymetry, and terrestrial lidar
- Satisfied with lidar data quality where lidar data are available
- Unsatisfied with gaps in coverage, data cost, quality, access and ease of use

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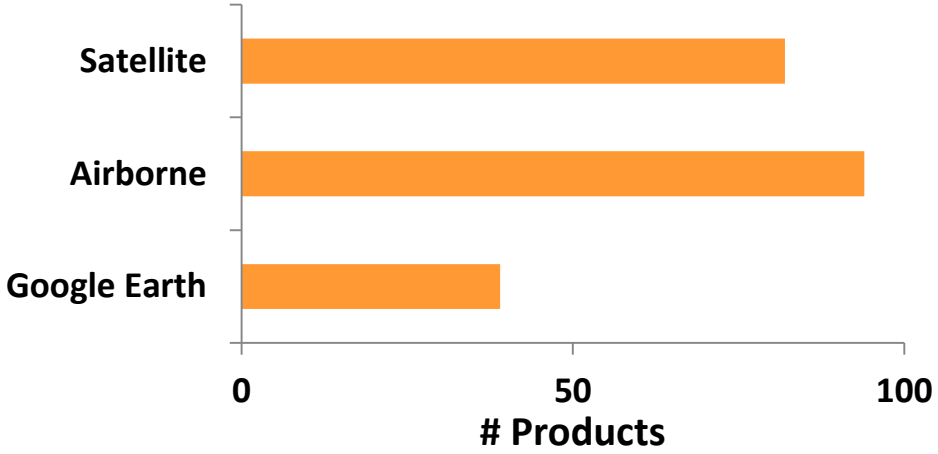
Commercial imagery usage in USGS



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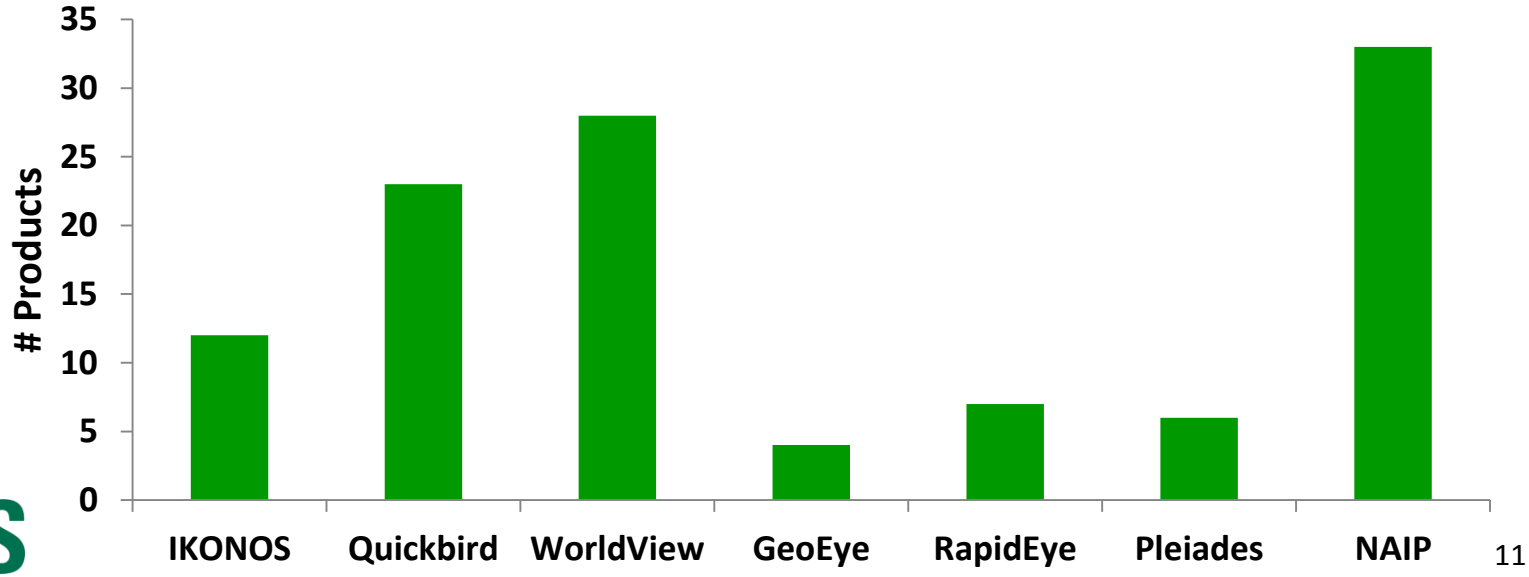
- All 7 mission areas use high resolution commercial imagery
- A combination of satellite and airborne sources



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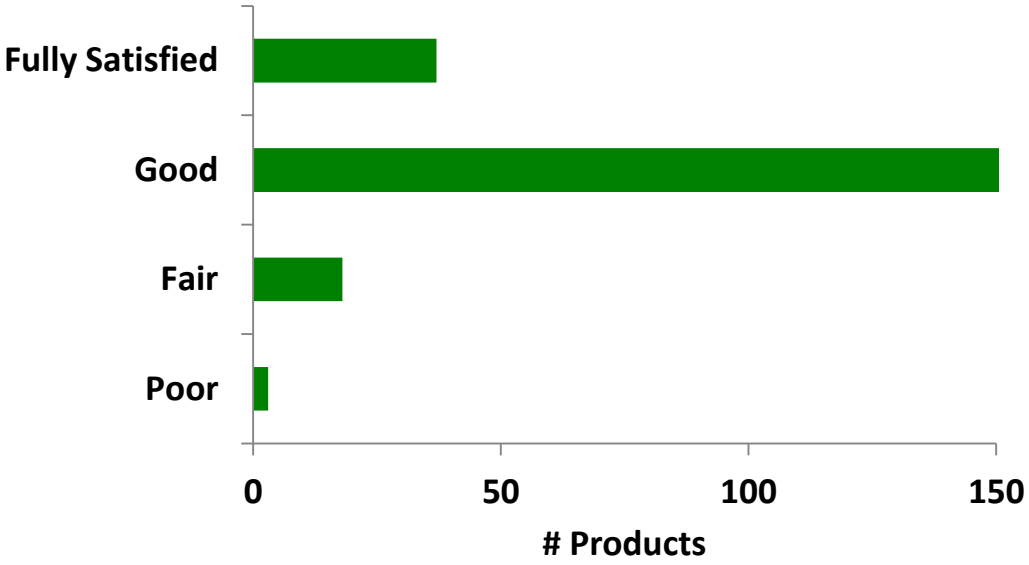
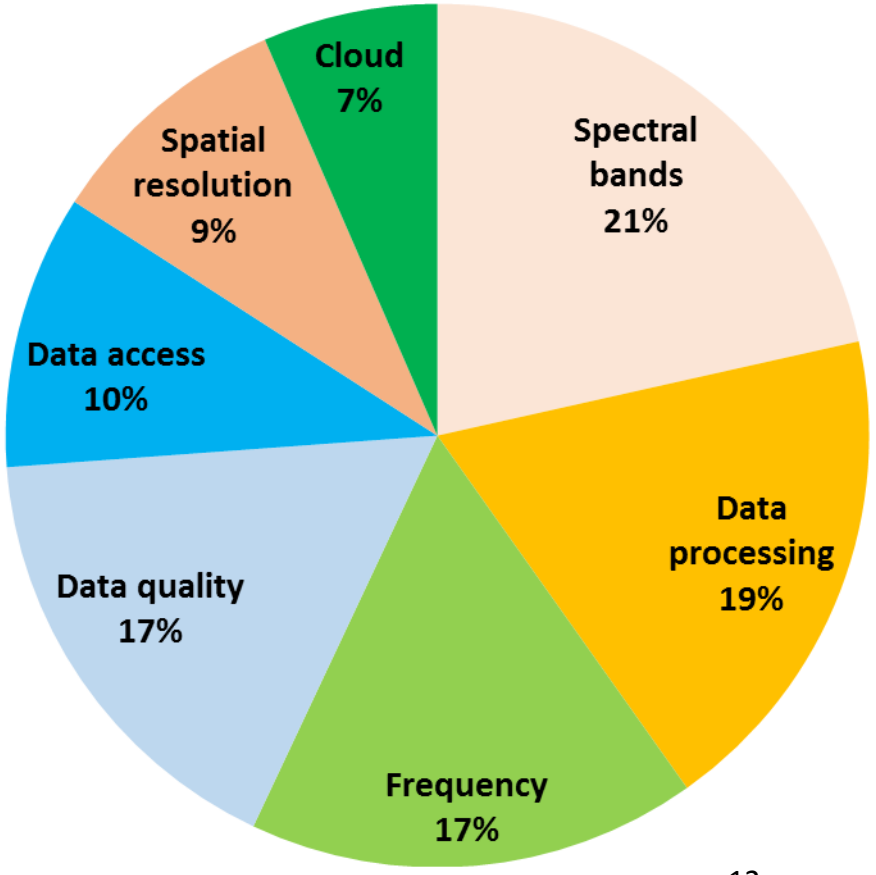
User satisfaction with commercial imagery in USGS





- Most users rated “Good”
- Satellite – DG contract via NGA; Airborne – Availability limitation/cost
- Data processing - georeferenced, orthorectified imagery
- Satellite imagery – Cloud cover

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User Requirements

- User Requirements
  - Identifies the fundamental information needed by the user
  - Not system-dependent; technology agnostic
  - Attributes include
    - Geographic Coverage
    - Horizontal Resolution
    - Vertical Resolution (if applicable)
    - Sampling Interval
    - Accuracy
    - Data Latency
    - Conditions for Sampling
    - Length of the Data Record
    - Spectral Characteristics
    - Data Services, Access and Formats

User Requirements

- For each requirement there are 3 potential levels:
  - **Threshold**
    - The minimum requirement
  - **Breakthrough**
    - An intermediate requirement level of significant improvement
  - **Target**
    - Above which only limited improvement in performance

	Level	Geographic Coverage	Horizontal Resolution	Sampling Interval	Accuracy
Biomass	Threshold	CONUS+HI	250 m	5 yr	
	Breakthrough	CONUS+HI+AK	30 m	3 yr	80%
	Target	Global	1 m	1 yr	85%

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RCA-EO Summary

- Comprehensive and sustained user evaluation of Earth observing impacts on all USGS key products and services
- Strong partnership with OSTP, NOAA, DOI and many participating agencies providing their user needs and subject matter expertise
- Supports improved investment decisions for USGS products and technology investments with the goal of better meeting user needs

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Questions?

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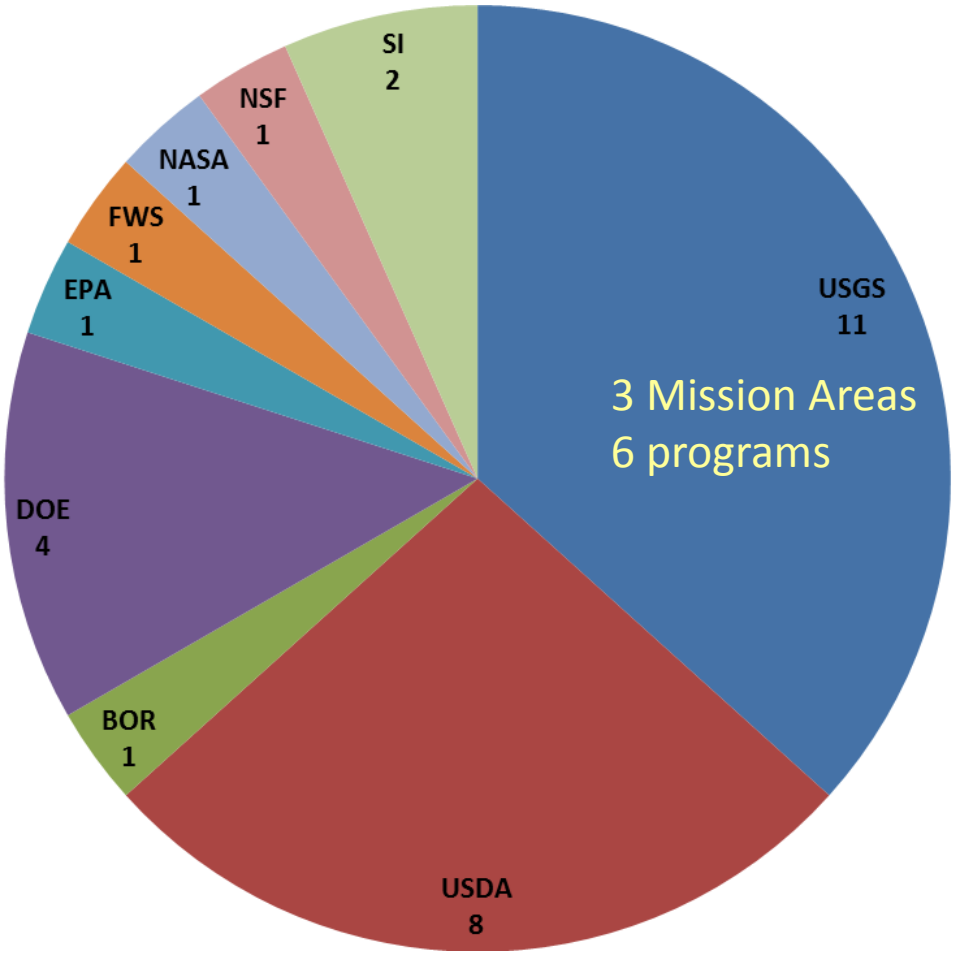
Biomass Essential Climate Variable (ECV)

❖ **Need for a Biomass ECV product through USGS and EOA Value Tree**



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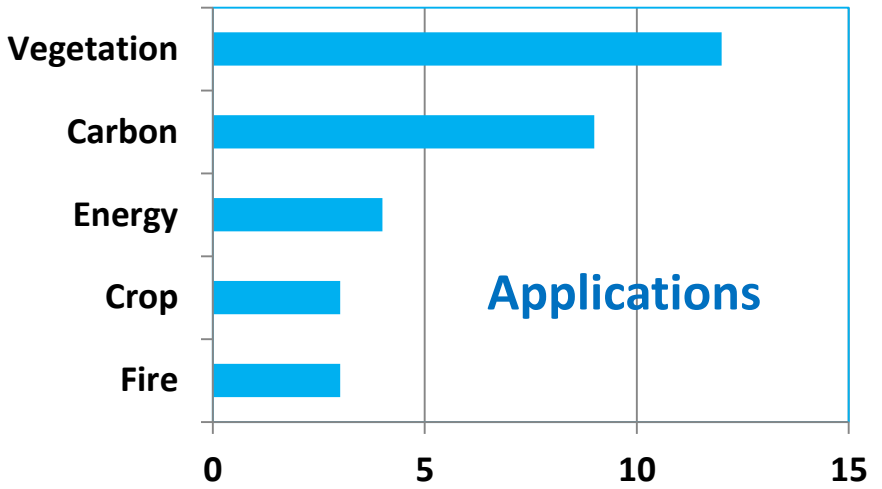

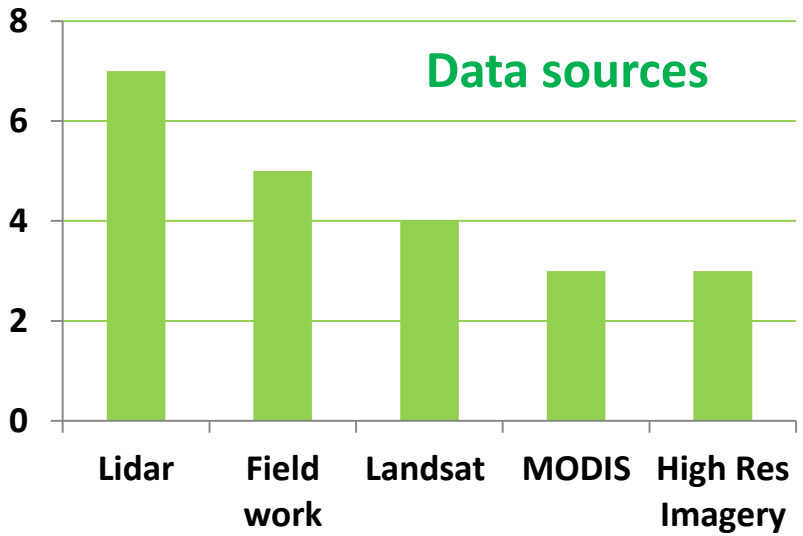

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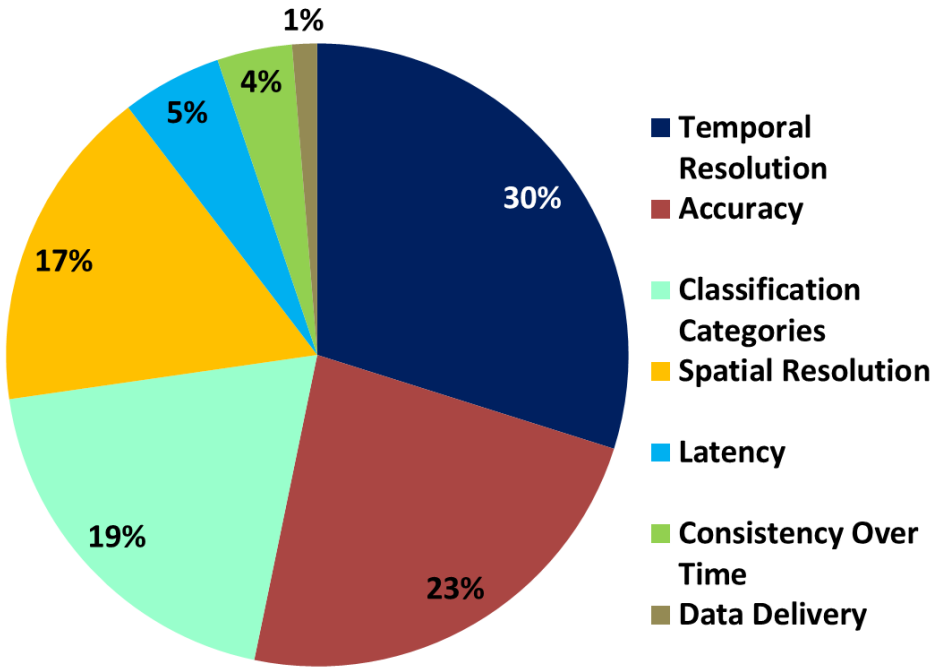
- 9 Agencies
- 30 Key Products

National Land Cover Dataset (NLCD) - User Satisfaction in USGS

- 77/345 of USGS products surveyed use the NLCD
- Satisfaction with the products ranged from Very Poor to Fully Satisfied

- **Desire**
  - **Finer spatial resolution**
  - **Higher temporal resolution (annual update)**
  - **Quicker product turnaround**
  - **More land cover categories**
  - **Eliminate inconsistencies between product releases**
  - **Desire for web services delivery**
  - **The new Shrub product received very positive comments**



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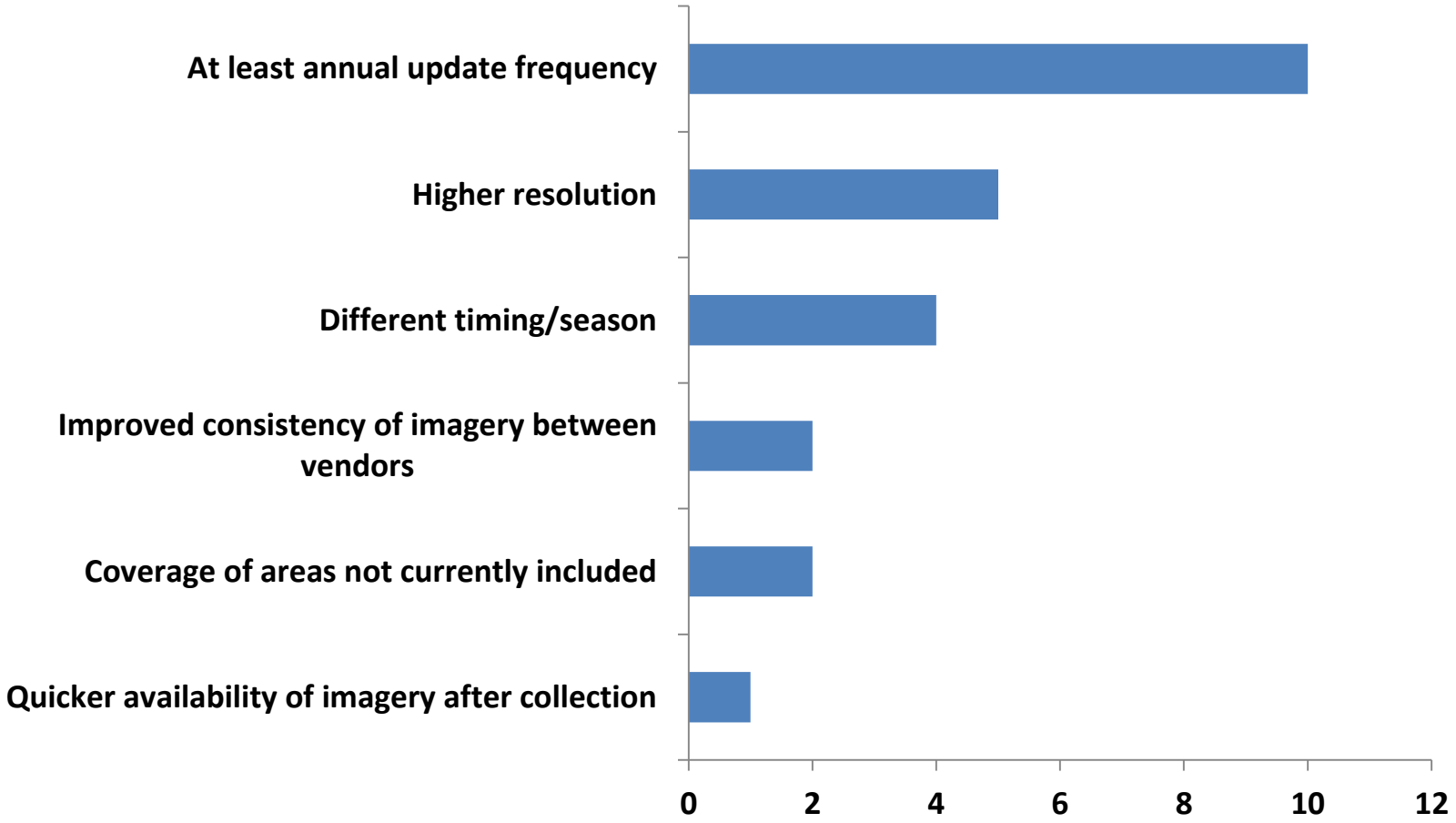
User Comments Regarding Desired NAIP Enhancements

(users not fully satisfied with current imagery)



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